GROUNDWATER MONITORING WORKPLAN 2003
FORMER C-6 FACILITY
LOS ANGELES, CALIFORNIA

by

Haley & Aldrich, Inc.
San Diego, California

for

Boeing Realty Corporation
Long Beach, California

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BOEING REALTY CORPORATION
FORMER C-6 FACILITY
LOS ANGELES, CALIFORNIA

Prepared for

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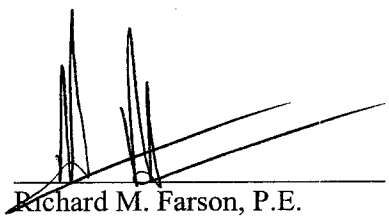

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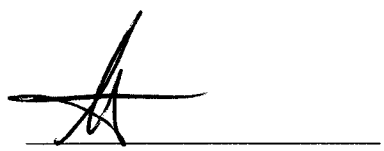

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1.0 INTRODUCTION

This work plan has been prepared for continuing groundwater monitoring at Boeing Realty Corporation's (BRC) Former C-6 Facility (Site) in Los Angeles, California (Figure 1). A total of 39 groundwater monitoring events have been performed since 1987. Two monitoring events are planned for 2003: a Site-wide annual event in March and a source-area specific event in September. This workplan identifies the groundwater monitoring wells that will be sampled and chemicals that will be analyzed during each event. The following sections of this workplan present a Site background, the proposed groundwater monitoring program, and reporting.

1.1 Background

1.1.1 Site Geology

The Site is located on the Torrance Plain physiographic area of the West Coast Basin. Groundwater monitoring wells and soil borings drilled at the Site have encountered the Lakewood Formation. The Lakewood Formation consists of two major Hydrostratigraphic Units; the Bellflower Aquitard and the Gage Aquifer. Groundwater monitoring wells at the Site have only been installed within the Bellflower Aquitard, which extends to a depth of approximately 140 feet below ground surface (bgs). The top 20 to 50 feet of the Bellflower Aquitard below the Site consists of fine-grained soils (predominantly fine sands, silts, and clays) that become thicker to the east. A sandy zone that dips downward to the east underlies the fine-grained soils. The sandy zone is generally 80 to 100 feet thick and contains discontinuous layers of fine-grained sediment that also dip down to the east. Although the fine-grained layers within the sandy unit are discontinuous, there are two separate fine-grained layers that are relatively continuous. Beneath some areas of the Site, the discontinuous fine-grained units overlap. The sandy unit is underlain by another fine-grained zone at approximately 110 to 140 feet bgs.

1.1.2 Site Hydrogeology

Groundwater conditions at the Site are reasonably understood from previous investigations and groundwater monitoring events (Kennedy/Jenks Consultants, 2000a and Haley & Aldrich, Inc./England Geosystem, 2001). Groundwater at the Site is located in sediments of the Bellflower Aquitard, which has two sub-units, the Middle Bellflower Aquitard and the Lower Bellflower Aquitard. The uppermost groundwater appears to be under water table conditions at depths of 60 to 70 feet bgs. Most of the Site groundwater monitoring wells are screened near the water table at depths ranging from 55 to 90 feet bgs. Two deeper wells, WCC-1D and WCC-3D, were screened in a deeper zone at approximately 115 to 140 feet bgs and have since been abandoned.

Groundwater flow at the Site is predominately to the south under a gradient of approximately 0.001 feet/feet. The following sections briefly discuss the site-specific water-bearing units of the Middle Bellflower Aquitard (Poland and others, 1959 and Department of Water Resources [DWR], 1961).

1. Middle Bellflower Aquitard

The Middle Bellflower Aquitard is a massive, light yellowish brown, fine to medium sand with local muddy zones. An extensive mud layer referred to as the Middle Bellflower mud (MBFM) locally interrupts this sand. Where divided, the top sand subunits are referred to as the B-Sand (MBFB) and the bottom sand subunits are referred to as the C-Sand (MBFC).

a. B-Sand (MBFB)

The B-Sand is found at an approximate depth of 60 to 72 feet bgs at the Site and is generally from 25 to 40 feet thick. The B-Sand predominantly consists of interbedded fine sands and silts. Groundwater flow within the B-Sand is predominantly to the south.

The uppermost groundwater at the Site occurs within the B-Sand at depths of 60 to 70 feet bgs. Most of the groundwater monitoring wells at the Site are completed within the B-Sand. Table 1 includes groundwater monitoring well completion information.

b. Middle Bellflower Mud (MBFM)

The MBFM is discontinuous in the Site area, and is comprised of laminated silts, layered silts, and very fine sands. Thickness of the MBFM ranges from approximately 3 to 13 feet.

c. C-Sand (MBFC)

The C-Sand is found at an approximate depth of 97 to 107 feet bgs at the Site and extends to a depth of up to approximately 125 feet bgs. The C-Sand predominantly consists of interbedded medium to fine sands. Groundwater flow within the C-Sand is reported to be to the southeast (Kennedy Jenks Consultants, 2000a). No wells are completed within the C-Sand at the Site.

2. Lower Bellflower Aquitard (LBF) and Gage Aquifer

The fine-grained Lower Bellflower Aquitard (LBF) appears to be continuous across the area. It occurs at an approximate depth of 114 to 150 feet bgs and ranges in thickness from 10 to 25 feet. The LBF separates the Bellflower sands from the underlying Gage Aquifer. The Gage Aquifer in the Site vicinity is predominantly sand and ranges in thickness from 40 to 78 feet thick. No groundwater monitoring wells are screened in the LBF or Gage Aquifer at the Site.

1.2 Historical Groundwater Monitoring Events

Groundwater information at the Site (Figure 2) comes from three primary sources:

- Groundwater monitoring wells installed at the Site by BRC and its predecessors (prefixes include WCC and TMW);
- Groundwater monitoring wells installed on the Site by International Light Metals (ILM) for investigations at ILM (prefixes DAC and BL); and
- Groundwater monitoring wells installed on the Site by Montrose Chemical Corporation (Montrose) for investigations at Montrose (prefix XMW).

Groundwater investigations began in early 1987 with the installation of groundwater monitoring well WCC-1S. A total of 43 groundwater monitoring wells have been installed at the Site for groundwater investigations since 1987. Nineteen of these groundwater monitoring wells have been abandoned as a result of redevelopment activities. Groundwater monitoring wells known or assumed to currently exist on the Site are shown on Figure 2. There are a total of 24 groundwater monitoring wells that are currently on-site. Well XMW-18 is scheduled to be abandoned by Montrose Chemical prior to the annual sampling event and is not included in the 2003 monitoring program.

Approximately 39 groundwater monitoring events have taken place at the Site. Typically, all of the groundwater monitoring wells were sampled during each groundwater monitoring event, which was performed quarterly until 1997. In 2000, the groundwater monitoring program was modified to consist of two events per year (Kennedy Jenks Consultants, 2000b).

The most recent groundwater monitoring data were collected in September 2002 and the associated report (Haley & Aldrich, Inc., 2002a) describes a typical monitoring event for the Site:

- Twenty-nine project groundwater monitoring wells were gauged, purged and sampled.
- Water samples were analyzed for Volatile Organic Compounds (VOCs) by EPA Method 8260B.
- Quality Assurance/Quality Control samples (duplicate samples, trip blanks, and equipment blanks [one per day]) were collected and analyzed.

Results of the 2002 groundwater monitoring are summarized in the Annual and Semiannual Groundwater Monitoring Reports (Haley & Aldrich, Inc., 2002a and 2002b, respectively). In general, groundwater conditions with respect to elevations, flow direction, and chemical concentrations are similar to previous years. Based on the apparent stability of the Site groundwater conditions, the following sections present the proposed 2003 groundwater monitoring program.

2.0 PROPOSED GROUNDWATER MONITORING PROGRAM

The proposed 2003 groundwater monitoring program consists of two sampling events:

- Annual monitoring (March 2003) and
- Semiannual monitoring (September 2003).

The above events are described in Sections 2.1 and 2.2. General monitoring considerations are described in Section 2.3. Details of the groundwater monitoring are described in Table 2 and Figures 2 and 3.

2.1 Annual Groundwater Monitoring

An annual monitoring event will be performed in March 2003. The routine groundwater monitoring program described in Section 2.3.2 will be performed at 24 groundwater monitoring wells as indicated in Table 2. Depth to groundwater will be measured in the 24 groundwater monitoring wells. Groundwater samples will be collected and analyzed for VOCs by EPA Method 8260B. Dissolved oxygen (DO) and oxidation-reduction potential (ORP) parameters will also be measured in the field for wells according to Table 2. The monitoring methodology is presented below in Section 2.3.

If select wells cannot be accessed due to Site redevelopment activities, they will be scheduled for gauging and sampling during the semiannual event. Groundwater monitoring wells installed by Montrose and ILM will be sampled through coordination with their respective environmental contractors.

2.2 Semiannual Monitoring

A semiannual monitoring event will be performed in September 2003. The routine groundwater monitoring program described in Section 2.3.2 will be performed at a reduced number (13) of groundwater monitoring wells as indicated in Table 2, focusing on the primary areas of groundwater impact. Depth to groundwater will be measured in the 24 groundwater monitoring wells listed in Table 2. The wells that will be sampled in the reduced semiannual program were selected to monitor elevated source-area impacts and down-gradient conditions. Samples collected during the semiannual event will be tested for VOCs by EPA Method 8260B (Table 2). DO and ORP parameters will also be measured in the field for wells according to Table 2. The monitoring methodology is presented below in Section 2.3.

2.3 Groundwater Monitoring Methodology

2.3.1 Health and Safety

In accordance with the federal Occupational Safety and Health Act (OSHA), the work will be performed under a site-specific Health and Safety Plan that complies with OSHA standards for potentially hazardous field investigations (29CFR 1910.120). The existing Health and Safety

Plan for groundwater monitoring at the BRC Former C-6 Facility will be used by field staff while conducting field activities (Haley & Aldrich, Inc., 2001).

2.3.2 Fieldwork - Groundwater Monitoring and Sampling

BRC will notify the Los Angeles Regional Water Quality Control board (LARWQCB) a minimum of one week prior to the start of groundwater monitoring events. The following activities will be performed:

1. Water Level Gauging

   Prior to sampling each monitoring well, depth to groundwater will be measured in each well to the nearest one-hundredth of a foot using an electronic water level sounder. Data from the well gauging will be recorded in the Well Gauging Data Sheet (Appendix A) as well as the Boeing Data Management Plan (DMP) electronic form for upload to the project database (Appendix B). Monitoring well vapor concentrations will be measured with a photo-ionization detector (PID) following the removal of the well cap and results will be recorded on the Well Gauging Data Sheet. The 24 groundwater monitoring wells will be gauged within a single 24-hour period with the same water sounding tape.

2. Well Purging and Sampling

   Groundwater monitoring wells will be sampled in order of increasing concentration, based on historical concentrations. Table 2 provides a recommended groundwater sampling order for the annual sampling event based on the most recent analytical results from each well (March or September 2002) (Haley & Aldrich, 2002a and 2002b). The sampling order for the semiannual sampling event will be based on the results of the 2003 annual event.

   Following well gauging, each well will be purged by extracting a minimum of three wetted well casing volumes of standing water with a pump. The depth to water, temperature, pH, and specific conductance will be measured and recorded periodically on the Groundwater Sampling Data Sheet (Appendix A) after each one-half wetted casing volume is purged from the well. Purging will be completed when a minimum of three wetted casing volumes have been removed and when three consecutive measurements of specific conductance, pH, and temperature are within 10% of each other. If parameters do not stabilize after five casing volumes, purging will be complete. Dedicated tubing will be used for each well to minimize potential sampling equipment interference.

   The submersible pump will be placed at a depth as close to the drawn-down water table as possible (within 5 feet). The purge rate will not exceed 2

gallons per minute (gpm) for 4-inch diameter wells and 1 gpm for 2-inch diameter wells.

Dissolved oxygen (DO) and oxidation reduction potential (ORP) parameters will also be measured in the field in select wells per Table 2. These parameters will be collected and recorded in accordance with the Standard Operating Procedures for Measuring Natural Attenuation Parameters (England Geosystem and Haley & Aldrich, 2001).

After well purging parameters have stabilized, the pumping rate will be decreased to less than 0.1 gpm and groundwater samples will be collected from the pump discharge in appropriate containers. Samples will be stored on ice in a cooler and transported by courier to a California-certified analytical laboratory for analysis under proper chain-of-custody. Chain-of-custody forms will be maintained throughout sample collection and transport. An example of the chain-of-custody form is provided in Appendix A. The appropriate chain-of-custody information will also be electronically uploaded to the project database.

Equipment used for well purging and sampling will be cleaned prior to and between groundwater monitoring wells with an Alconox solution (or equivalent) and then double rinsed with tap water and deionized or distilled water to reduce the potential for cross-contamination. Well purge water and water used to decontaminate equipment will be stored in properly labeled, DOT 55-gallon drums and stored on site at a location selected by BRC. The drums will be properly manifested and disposed of by BRC following receipt of laboratory results.

Groundwater analytical results will be reported in units of milligrams per liter (mg/L) or micrograms per liter (µg/L) on RWQCB Laboratory Report Forms 10A/10B or their equivalent. Field data will be collected and recorded on standard groundwater monitoring forms in accordance with the Boeing Electronic DMP (Boeing EDMS, 2001).

The laboratory reports will be submitted electronically to the firm that will provide project data management.

2.3.3 Quality Assurance/Quality Control

1. Duplicate Samples

One duplicate groundwater sample will be collected for every 20 groundwater samples (two in March and one in September). Sample duplicates are a check for sample homogeneity and laboratory accuracy. Duplicates will be collected, numbered, packaged, and sealed in the same manner as the other samples. Duplicates will be assigned separate sample numbers and submitted

blind to the laboratory. Duplicate samples will be analyzed for VOCs by EPA Method 8260B.

2. Rinsate Blanks

   One equipment rinsate blank sample will be collected prior to initiation of sampling activities and another will be collected each day throughout the duration of the sampling event when sampling equipment is cleaned and re-used in the field. (five in March and three in September). Equipment rinsate blank samples are a check for cross-contamination during sample collection. Deionized water will be used to fill or rinse the sampling equipment after the equipment has been cleaned, and then collected in the sample containers. The equipment rinsate blanks will be analyzed for VOCs by EPA Method 8260B.

3. Field Blanks

   One field blank will be collected each day with laboratory supplied water to check for contamination by sampling methodology. The field blanks will be analyzed for VOCs by EPA Method 8260B.

4. Decontamination Water

   One water sample will be collected from the water used for decontamination of the sampling equipment. The decontamination water sample will be analyzed for VOCs by EPA Method 8260B.

5. Travel Blanks

   One travel blank will be prepared in the laboratory for each day that groundwater samples are collected and shipped to the laboratory. The travel blanks will be prepared in a clean environment and kept in the cooler used to ship samples. The travel blank provides a check for cross-contamination during transport, and will be analyzed for VOCs by EPA Method 8260B.

2.3.4 Data Validation

A subcontractor (Laboratory Data Consultants, Inc. [LDC]) will perform two levels of data validation: Tier 2 and Tier 3 validation. The validation process will follow the U.S. Environmental Protection Agency (EPA) Contract Laboratory Program National Functional Guidelines for Organic Data Review (October 1999). Ten percent of the data will be subjected to Tier 3 analysis (3 samples in March and 1 sample in September). An additional 20% of the data will be validated according to Tier 2 criteria (5 samples in March and 3 samples in September).

2.3.5 Future Groundwater Monitoring Wells

The Site redevelopment plan is pending and currently unknown. Some existing groundwater monitoring wells may be closed and new groundwater monitoring wells may be added. An addendum to this groundwater monitoring plan will be issued for any changes to this proposed groundwater monitoring program.

3.0 GROUNDWATER MONITORING REPORT

Groundwater monitoring reports similar to those submitted to date that, as a minimum, contain the following will be prepared and submitted:

- A groundwater elevation contour map;
- Tables and figures that depict groundwater analytical results;
- Groundwater sampling forms and field notes documenting field activities;
- Laboratory reports and chain of custody documentation;
- Appropriate descriptions of the sampling event, test results, and discussion and conclusions regarding water quality and hydrogeologic changes at the Site;
- Discussion of changes in Site/well conditions that might affect future sampling events; and
- Recommendations for modifications to the sampling program, if necessary.

Reports will be submitted to LARWQCB approximately 60 days after the completion of each sampling event with monitoring events occurring in March and September, reports will be provided to the LARWQCB in May and November 2003. The reports will consist of a hard copy of text, tables, figures, and analytical data. An electronic version of the report on compact disc will also be provided with the hard copy document.

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